

## **Lessons Learned: Hydrostratigraphic Analysis and Accelerated Cleanup at Lawrence Livermore National Laboratory (LLNL)**

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During the last 3 years, hydrostratigraphic analysis has become a key component for implementing the environmental cleanup at LLNL. With this methodology, hydrogeologists at LLNL have developed a comprehensive, 3D hydrogeologic conceptual model at a site underlain by complex heterogeneous alluvial sediments. This effort is focused on providing the data necessary to make better management decisions and reduce costs. Detailed analyses of contaminant plume geometries, contaminant migration pathways, and ground water gradients in each hydrostratigraphic unit (HSU) are used to position and design extraction wells for optimal VOC mass removal and hydraulic capture. Time series maps showing contaminant distributions are constructed for each HSU. These maps are used to optimize the operation of remedial well fields to accelerate cleanup. A major benefit of this type of analyses is the improved ability to provide clear, technically defensible evidence for demonstrating effective ground water cleanup to DOE, the regulators, and the community.

A major concern at LLNL is implementing the cleanup in a cost-effective manner. Short-term cost savings result from: 1) fewer extraction and monitor wells required per facility area, 2) fewer re-drills of misplaced wells, 3) more effective positioning of extraction wells to minimize costly pipeline construction; and 4) decreased analytic costs associated with compliance monitoring requirements. Significant long-term cost savings include: 1) accelerating site cleanup; and 2) streamlining regulatory compliance requirements. Our experience at LLNL suggests that continuing to develop a hydrogeologic conceptual model during implementation of the cleanup is a good investment for large, complex sites.

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